Claims:

Having thus described the invention, what we claim as new, and desire to secure by Letters Patent is:

1   1.   A method for tracing computer system operations of a computer system
2   comprised of a plurality of functional units, comprising the steps of:
3   storing in a storage memory execution path information for each
4   computer system operation including computer system operation graphs, each of which
5   computer system operation graphs is a complete description of the sequence of
6   operation states the computer system operation assumed during a traced computer
7   system operation,
8   assigning a unique operation identifier ID to each traced computer
9   system operation,
10   maintaining the unique operation identifier ID constant during
11   processing of each traced computer system operation by the plurality of functional units
12   of the computer system,
13   associating each traced computer system operation with its own
14   individual and dedicated, event-triggered, operation graph finite state machine which
15   contains the complete specification of legal computer system operation state transitions,
16   and which monitors the plurality of functional units to trace the path of that traced
17   computer system operation through the computer system,
18   each functional unit generating and reporting events for traced computer
19   operations along with its associated operation identifier ID,
20   for each traced computer system operation, storing in its own dedicated
21   operation graph finite state machine and in storage memory, events generated and
22   reported with each associated operation identifier ID by different functional units for
23   that specific traced computer system operation,
24   evaluating the contents stored in a dedicated operation graph finite state
25   machine to retrieve trace data information for a traced computer system operation.

1   2.   The method of claim 1, wherein each functional unit includes event generation

2   logic for reporting events associated with traced computer operations in that functional

3   unit.

1   3.   The method of claim 1, wherein all of the operation graph finite state machines

2   report to a common trace array in the storage memory which stores events from

3   different functional units in each operation graph finite state machine, and the common

4   trace array is selectively accessed to analyze trace data information.

1   4.   The method of claim 1, including adding a time stamp to each entry in storage

2   memory.

1   5.   The method of claim 1, wherein a unique operation identifier ID is assigned to a

2   traced computer operation until after the completion of the traced computer operation or

3   after a restart of the computer system, and is then reassigned to another traced computer

4   operation.

1   6.   The method of claim 1, wherein each change of state in one of the operation

2   graph finite state machines generates an entry in a trace array, and each entry is marked

3   with a time stamp.

1   7.   The method of claim 1, wherein each operation graph finite state machine is a

2   specification of all legal subtask execution sequences and an illegal event causes an

3   operation graph finite state machine to branch to an error state.

1   8.   The method of claim 1, wherein all traced computer operations are monitored

2   all of the time during operation of the computer system up until after completion of the

3   traced computer operation or after a restart of the computer system.

1   9.   The method according to claim 1, characterized by the steps of,

2   using signatures for coding state sequence relating information of an

3 operation with the help of register storage means and a polynomial,

4   characterizing said sequence by an operation graph specified by a finite

5 state machine.

1 10. The method according to claim 9, characterized by the steps of,

2   forming the signature starting from an idle state of the operation, and

3   associating the operation states for the operation graph finite state

4 machine and the polynomial such that each existing state sequence starting from the idle

5 state has a unique signature.

1

1 11. A data carrier on which a program is stored implementing the method

2 according to claim 1.

1

1 12. A computer system comprised of a plurality of functional units, and comprising:

2   a storage memory for storing computer system operation path relating

3 information including computer system operation graphs, each of which computer

4 system operation graphs is a programmed description of a sequence of operation states

5 of the computer system to perform a traced computer system operation,

6   means for assigning a unique operation identifier ID to each traced

7 computer operation which is maintained constant during processing of each traced

8 computer system operation by the plurality of functional units of the computer system,

9   means for associating each traced computer system operation with its

10 own individual and dedicated, event-triggered, operation graph state machine which

11 contains state control information of the plurality of functional units to trace the path of

12 that traced computer system operation through the computer system,

13   each functional unit generating and reporting events for traced computer

14 operations along with its associated operation identifier ID,

15   the storage memory storing, for each specific traced computer system

16 operation, in its own individual dedicated operation graph finite state machine, events

17   generated and reported with its associated operation identifier ID by different functional

18   units for that traced computer system operation.

1   13.   The system of claim 12, wherein each functional unit includes event generation

2   logic for reporting events associated with traced computer operations in that functional

3   unit.

1   14.   The system of claim 12, wherein all of the operation graph finite state machines

2   report to a common trace array in the storage memory which stores events from

3   different functional units in each operation graph finite state machine, and the common

4   trace array is selectively accessed to analyze trace data information.

1   15.   The system of claim 12, including means for assigning a unique operation

2   identifier ID to a traced computer operation until after the completion of the traced

3   computer operation or after a restart of the computer system, and the unique operation

4   identifier ID is then reassigned to another traced computer operation.

1

1   16.   The system of claim 12, including means for generating an entry in a trace array

2   for each change of state in one of the operation graph state machines, and each entry is

3   marked with a time stamp.

1   17.   The system of claim 12, wherein each operation graph finite state machine

2   includes a summary in tables of a state of a traced computer operation which is

3   transferred to a succeeding state, all states are stored in a register, and an illegal event

4   causes an operation graph state machine to branch to an error state.

1   18.   The system of claim 12, wherein the computer system monitors all traced

2   computer operations all of the time during operation of the computer system up until

3   after completion of the traced computer operation or after a restart of the computer

4   system.

1   19.   The system according to claim 12, characterized by,

2   means for using signatures for coding state sequence relating information

3   of an operation with the help of register storage means and a polynomial,

4   means for characterizing said sequence by an operation graph specified

5   by a finite state machine.

1   20.   The system according to claim 19, characterized by,

2   means for forming the signature starting from an idle state of the

3   operation and

4   means for associating the operation states for the operation graph finite

5   state machine and the polynomial such that each existing state sequence starting from

6   the idle state has a unique signature.